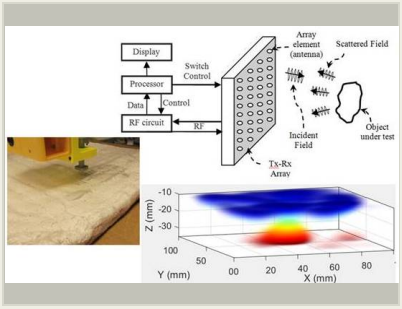
Small Business Innovation Research/Small Business Tech Transfer

Millimeter-Wave Camera, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

Traditional SAR imaging at millimeter wave frequencies can provide excellent, high SNR, 3D images of features inside dielectric solids. However, imaging at these frequencies requires thousands of measurements; raster scanning for data collection is time consuming; and data analysis and image rendering requires additional time. These limitations make millimeter wave SAR imaging for nondestructive evaluation prohibitive outside the lab. We propose to show feasibility of overcoming these restrictions by designing a real-time, high-resolution, portable and 3D imaging system for terrestrial and in-space inspection applications. We will demonstrate ability to produce high-fidelity 3D images from substantially reduced data with minimal image quality degradation. We will also investigate further enhancements via spectral estimation or compressive sensing techniques. In Phase I we will design an adaptive, custom sampled, SAR-based millimeter wave imaging system for nondestructive inspection of complex composites and structures. The design of this imaging system will be based on novel and substantial innovations to a well establish knowledge base. The innovations involve overcoming hardware and software limitations that currently make 3D imaging at millimeter wave frequencies slow, cumbersome and impractical for widespread use. Our goal is to design a system with: center frequency in the millimeter wave range; significant bandwidth; high-spatial and range resolutions; rapid image data collection; real-time image rendering; ability to image multi-layer structures made of different materials; high system dynamic range (high detection sensitivity); electrical and mechanical design allowing adaptation to use in-space; modular and frequency-scalablity to accommodate large structures; user friendly design to allow operation by people of various skill sets. The Phase I effort will include simulations and small-scale testing.



Millimeter-wave Camera, Phase I Briefing Chart Image

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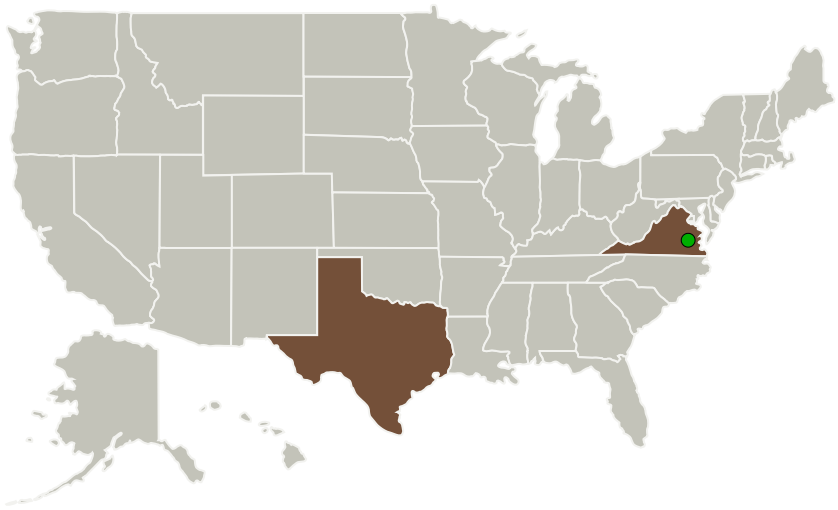
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Texas Research Institute Austin, Inc.	Lead Organization	Industry	Austin, Texas
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Texas	Virginia

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Texas Research Institute Austin, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

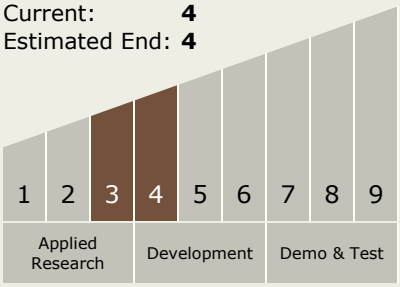
Carlos Torrez

Principal Investigator:

Russell K Austin

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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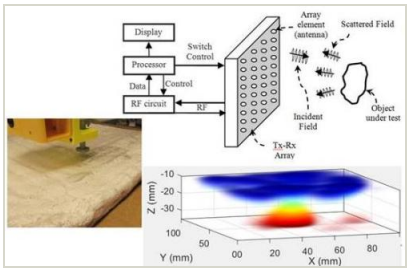
Images



Briefing Chart Image
Millimeter-wave Camera, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/131195)

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves